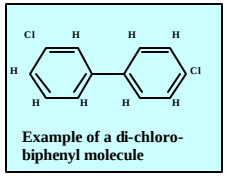
WHAT ARE PCBs?

Polychlorinated Biphenyls (PCBs)



Example of a di-chloro-biphenyl molecule

- 209 related compounds (congeners) formed by chlorination of biphenyl molecule
- Congeners grouped into "homologs" defined by the number of chlorine atoms attached to the carbon rings

- Synthetic organic compounds manufactured in large quantities in the US from 1929 until banned in 1977 by the Toxics Substances Control Act (TSCA)
- There are no natural sources of PCB
- Complex mixtures sold under trade name "Aroclor".
- From 1929 until 1979 PCBs widely used as coolants and lubricants in electrical equipment; also used in consumer products such as fluorescent lighting, heat resistant hydraulic fluids, paints, adhesives, flame retardants, & pesticide carriers.
- 1.88x106 lbs. released to environment in 2004 (EPA TRI).

Characteristics of PCBs

- Highly lipophilic (fat soluble)
- Hydrophobic (very weak affinity for water)
- Rapidly bioaccumulate
- Bioaccumulation factors generally increase with chlorine content from homolog Tri thru Hexa; then decrease Hepta thru Octa
- Very stable, do not break down easily in the environment & thus may remain for a long period of time

Effects of PCBs

- Immunological, neurological, reproductive & developmental effects in humans and wildlife.
- Known to cause cancer in lab animals.
- Classified as probable human carcinogen.
- Acne-like skin conditions in adults.

How PCBs Enter the Environment

- PCB equipment manufactured prior to July, 1979 may still be in use (useful life 30-50 yrs.)
- PCB can or were be released to the environment by:
  - leaks or fires in PCB equipment
  - accidental spills during transport
  - illegal/improper disposal
  - burning of some wastes in incinerators
  - hazardous waste sites
  - historical releases during manufacture, use & disposal

Sources of PCBs

- **Point Sources** – municipal and industrial wastewater treatment plants
- **NonpointSources** – stormwater runoff from urban areas, combined sewer overflows, atmospheric deposition, runoff from contaminated sites
- **Tributaries** – contamination from entering the Potomac from smaller tributary rivers

2004 EPA National Listing of Fish Advisories

- PCBs 2nd leading cause of advisories
- 110,552 river miles (13% of total river miles with advisories)
- 4,652,401 lake acres (32% of total lake acres with advisories)

Potomac PCB Water Quality Targets

State Criteria

	Consumption Advisories Fish Tissue (ppb)	Water Quality Standards (ng/l)
DC DOE	20 (EPA screening value)	0.064
MDE	88	0.64
VADEQ	54	1.70

Historical (1992-2003) Levels in the Potomac

- **Water Samples**: <1 – 6 ng/l in Anacostia (highest), at Chain Bridge, and in Potomac mainstem.
- **Fish Samples:** – <50 – 1,000 ppb (highest in DC, generally higher in upper part of estuary)